

What is claimed is:

1. A hydraulic ratchet wrench having, a double-action hydraulic cylinder, a displaceable piston located in said hydraulic cylinder, said piston having a piston rod protruding tightly from the hydraulic cylinder for ratchet actuation, a working stroke chamber located in said hydraulic cylinder with a high-pressure chamber on one piston side and a return stroke chamber as a low-pressure chamber on the other piston side with said piston rod, and a hydraulic pump arrangement, connected via hydraulic controls to the working stroke chamber and the return stroke chamber, with a gear pump and a piston pump, whereby said gear pump and said piston pump can be driven by means of a pump motor controlled by pump motor controls through its drive shaft and whereby the gear pump pumps a relatively large quantity of hydraulic oil per motor revolution and the piston pump pumps a relatively smaller amount per motor revolution, wherein said wrench comprises:

a first gear pump connection (26) connected to a working stroke oil line (7) and a working stroke chamber (17);

a second gear pump connection (27) connected to a return stroke oil line (8) and to a return stroke chamber (18);

said working stroke oil line (7) connected to an oil tank by a first connection point (28) via a first suction port (29) and a first suction check valve (30);

said return stroke oil line (8) connected at a second connection point (31) to said oil tank via a second suction port (32) and a second suction check

valve (33);

a high pressure check valve (34) with a blocking action in the direction of said first connection point (28) in said working stroke oil line between said first connection point (28) and said working stroke chamber (17);

5 said piston pump (21) connected to said oil tank via a piston pump suction line (36) having a piston pump delivering outlet (37) connected to said working stroke oil line (7),

 a hydraulic oil flowback line (39) communicating with said oil tank (2);
said flowback oil line connected via a low pressure limit valve (40) to said
10 working stroke oil line whereby a flowback is delivered by the low pressure limit valve (40) when a predetermined low pressure has been reached;

 said flowback oil line (39) connected via a unblocking check valve (41) controlled as a function of pressure in said return stroke oil line (8) to said working stroke oil line, said unblocking check valve normally blocking flow to
15 said flowback line; and

 a pump motor (4) actuated for a working stroke in one direction of rotation to pump oil through said delivery outlet of said gear pump, said pump motor (4) actuated for a return stroke to rotate in the opposite direction, to pump oil through said suction inlet of said gear pump, and said radial piston
20 pump (21) pumping oil in the same direction with both directions of rotation.

2. The hydraulic ratchet wrench of claim 1 including a high pressure limit safety valve (43) connected between said working stroke oil line (7) and said oil

flowback line (39).

3. The hydraulic ratchet wrench of claim 2 including a low pressure limit safety valve (44) connected between said return stroke oil line (8) and said oil flowback line (39).

5 4. The hydraulic ratchet wrench of claim 3 where said gear pump (20) is able to produce a maximum conveying pressure of approximately 100 bar and at least one of said low pressure limit valve (40) and said low pressure limit safety valve (44) is adjusted to approximately 70 bar.

5. The hydraulic ratchet wrench of claim 4 where said radial piston pump
10 (20) produces a maximum conveying pressure of approximately 700 bar and said high pressure limit safety valve (43) is adjusted within a range between said low pressure limit valve and approximately 700 bar.

6. The hydraulic ratchet wrench of claim 5 where the maximum working stroke chamber volume is greater than the maximum return stroke chamber volume
15 and wherein the ratio is approximately 3:1.

7. The hydraulic ratchet wrench claim 6 where said pump motor controls (22) are actuated manually or automatically and said wrenching process is controlled by one of manually, as a function of time as a function of working pressure and as a function of torque.

20 8. The hydraulic ratchet wrench of claim 7 where said pump motor (4) is one of an electric motor, a pneumatic motor, and a hydraulic motor.

9. The hydraulic ratchet wrench of claim 8 including:

a free wheel (48) installed in the drive of the radial piston pump (21) so that the radial piston pump (21) is driven with a rotational direction for a working stroke and in that the radial piston pump (21) is not driven with a rotation in opposite direction for a return stroke.

10. A hydraulic ratchet wrench having a double-action hydraulic cylinder with a piston that is displaceable in the hydraulic cylinder and is provided with a piston rod protruding from the hydraulic cylinder for ratchet actuation, a working stroke chamber in the hydraulic cylinder as a high-pressure chamber on one piston side, with a return stroke chamber as low-pressure chamber on the piston side with the piston rod, and a hydraulic pump arrangement with a gear pump and a piston pump connected via hydraulic controls to the working stroke chamber and the return stroke chamber to drive said wrench in alternating work strokes and return strokes, wherein said wrench comprises;

a gear pump connected to said working stroke chamber by a working stroke oil line and connected by a return stroke oil line to said return stroke chamber;

said working stroke oil line connected to an oil reservoir by a first suction port;

said return stroke oil line connected to said oil reservoir by a second suction port;

an oil backflow line connected to said working stroke oil line and said oil reservoir, and a blocking valve arranged in said backflow line to selectively deliver an oil flow from said working stroke oil line;

5 said piston pump connected to said oil reservoir by a piston pump suction line and to said working stroke chamber by said working stroke oil line;

a pump control actuating said gear pump in one direction of rotation for delivering oil through said working stroke oil line to said working stroke chamber, and actuating said gear pump in an opposite direction for delivering oil through said return stroke oil line to said return chamber;

10 a working stroke flow valve arrangement in communication with said working stroke oil line to direct a flow of working oil to said work stroke chamber during said work stroke;

15 a return stroke flow valve arrangement in communication with said return working stroke oil line and said flowback oil line to direct a flow of oil back to said oil reservoir during said return stroke; and

said working stroke and return stroke valve arrangements operating automatically in response to flow conditions to in one or more of said working stroke oil line, return stroke oil line, and backflow oil line caused by operating said gear pump in opposite directions.

20 11. The hydraulic ratchet wrench of claim 1 including a high pressure limit safety valve connected between said working stroke oil line and said oil backflow line.

12. The hydraulic ratchet wrench of claim 2 wherein said return stroke valve

arrangement includes a low pressure limit safety valve connected between said return stroke oil line and said hydraulic oil backflow conduit.

13. The wrench of claim 10 wherein said piston pump is activated by said pump control pump in the same direction with both directions of pump rotation.

5 14. The wrench of claim 10 wherein said return stroke flow valve arrangement includes a first blocking check valve blocking flow in the direction of the first suction port installed between the first suction connection point and the working stroke chamber in the working stroke oil line.

10 15. The wrench of claim 14 wherein said return valve arrangement includes an unblocking check valve disposed between said work stroke oil line and said oil flowback line normally blocking oil flow from said work stroke oil line to said flowback line.

15 16. The wrench of claim 15 wherein said return stroke flow valve arrangement includes a suction check valve disposed in said work stroke oil line blocking oil flow to said oil reservoir.

17. The wrench of claim 16 wherein said work stroke valve arrangement includes a first blocking check valve blocking the flow of oil in the direction of the first suction port disposed in said work stroke oil line.

20 18. The wrench of claim 17 wherein said work stroke flow valve arrangement includes a low pressure limit valve between the first suction connection point said working stroke oil line, whereby a flowback can be released by the low pressure limitation valve when a predetermined low pressure has been reached,.

19. The wrench of claim 18 wherein said work stroke valve arrangement includes a suction check valve disposed in said return stroke oil line.